Gulf Cooperation Council

EDICT OF GOVERNMENT

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GSO 64 (1987) (English): INDUSTRIAL SAFETY AND HEALTH REGULATIONS – HAZARDOUS MATERIALS — FLAMMABLE AND COMBUSTIBLE LIQUIDS- PART 3: INDUSTRIAL AND BULK PLANTS

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STANDARDIZATION ORGANIZATION FOR G.C.C (GSO)

GSO 64/1987

اشتراطات السلامة والصحة الصناعية
المواد الخطرة – السوائل القابلة للاشتعال
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INDUSTRIAL SAFETY AND HEALTH REGULATIONS – HAZARDOUS MATERIALS — FLAMMABLE AND COMBUSTIBLE LIQUIDS PART 3: INDUSTRIAL AND BULK PLANTS

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INDUSTRIAL SAFETY AND HEALTH REGULATIONS – HAZARDOUS MATERIALS — FLAMMABLE AND COMBUSTIBLE LIQUIDS PART 3: INDUSTRIAL AND BULK PLANTS

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INDUSTRIAL SAFETY AND HEALTH REGULATIONS – HAZARDOUS MATERIALS — FLAMMABLE AND COMBUSTIBLE LIQUIDS PART 3: INDUSTRIAL AND BULK PLANTS

1. SCOPE AND FIELD OF APPLICATION

This Standard is concerned with the regulations for industrial plants where the use of flammable or combustible liquids is incidental to the principal business, or where flammable or combustible liquids are handled or used only in unit physical operations such as mixing, drying, evaporating, filtering, distillation, and similar operations which do not involve chemical reaction. This Standard shall not apply to chemical plants, refineries or distilleries and where portions of such plants involve chemical reactions such as oxidation, reduction, halogenation, hydrogenation, alkylation, polymerization, and other chemical processes, those portions of the plant shall be in accordance with the Gulf Standard mentioned in item 2.3.

2. COMPLEMENTARY REFERENCES

2.1 GSO 62/87 “Industrial Safety and Health Regulations - Hazardous Materials - Flammable and Combustible Liquids - Part 1: Tanks, Piping and Accessories”.

2.2 GSO 63/87 “Industrial Safety and Health Regulations Hazardous Materials - Flammable and Combustible Liquids - Part 2: Containers and Portable Tank Storage”.

2.3 GSO 65/87 “Industrial Safety and Health Regulations - Hazardous Materials - Flammable and Combustible Liquids - Part 4: "Service Stations, Processing Plants, Refineries and Chemical Plants”.

2.4 GSO to be approved “Industrial Safety and Health Regulations - Buildings - Part 8: Fire Protection”.

2.5 GSO to be approved “Industrial Safety and Health Regulations - Electrical Part 2: - Low Voltage”.

3. DEFINITIONS

3.1 Adequate Ventilation. Ventilation sufficient to prevent accumulation of vapour-air mixtures in concentration over 25 percent of the lower flammable limit.

3.2 Basement: A story of a building or structure having one-half or more of its height below ground level and to which for fire fighting purposes is unduly restricted.

3.3 Bulk Plant: That portion of a property where flammable or combustible liquids are received by tank vessel, pipelines, tank car, or tank vehicle, and are stored or

blended in bulk for the purpose of distributing such liquids by tank vessel, pipeline, tank car, tank vehicle or container.

3.4 Pressure Vessel: Tank or vessel which has been designed to operate at pressures above 103 kPa.

3.5 Protection for Exposure: Fire protection for structures on property adjacent to tanks, where there are employees of the establishment.

3.6 Unstable (Reactive) Liquid: Liquid which in the pure state or as commercially produced or transported will vigorously polymerize, decompose, condense or will become self-reactive under conditions of shocks, pressure, or temperature.

4. REGULATIONS

4.1 Industrial Plants

4.1.1 Incidental Storage or Use of Flammable and Combustible Liquids

4.1.1.1 This item shall be applicable to those portions of an industrial plant where the use and handling of flammable or combustible liquids is only incidental to the principal business, such as automobile assembly, construction of electronic equipment, furniture manufacturing, or other similar activities.

4.1.1.2 Flammable or combustible liquids shall be stored in tanks or closed containers. Except as provided in Gulf Standard mentioned in item 2.1 all storage shall comply with the Gulf Standard mentioned in item 2.2, and as follows:

– The quantity of liquid that may be located outside of an inside storage room or storage cabinet in a building or in any fire area of a building shall not exceed:

  0.095 cu m of Class IA liquids in containers

  0.454 cu m of Class IB, IC, 2, or 3A liquids in containers

  2.5 cu m of Class IB, IC, 2 or 3A liquids in a single portable tank.

– Where large quantities of flammable or combustible liquids are necessary, storage may be in tanks which shall comply with the applicable requirements of Gulf Standard mentioned in item 2. 1.

4.1.1.3 Areas in which flammable or combustible liquids are transferred from one tank or container to another container shall be separated from other operations in the buildings by distance or by construction having fire resistance. Drainage or other means shall be provided to control spills. Adequate natural or mechanical ventilation shall be provided.

4.1.1.4 Flammable liquids shall be kept in covered containers when not actually in use.

– Where flammable or combustible liquids are used or handled, except in closed containers, means shall be provided to dispose promptly and safely of leakage or spills.

– Class 1 and 2 liquids may be used only where there are no open flames or other sources of ignition within the possible path of vapour travel. Flammable or combustible liquids shall be drawn from or transferred into

vessels, containers, or portable tanks within a building only through a closed piping system, from safety cans, by means of a device drawing through the top, or from a container or portable tanks by gravity through an approved self-closing valve. Transferring by means of air pressure on the container or portable tanks shall be prohibited.

4.1.2 Unit Physical Operations

4.1.2.1 This item shall be applicable in those portions of industrial plants where flammable or combustible liquids are handled or used in unit physical operations such as mixing, drying, evaporating, filtering, distillation and similar operations which do not involve chemical change. Examples are plants compounding cosmetics, pharmaceuticals, solvents, cleaning fluids, insecticides, and similar types of activities.

4.1.2.2 Industrial plants shall be located so that each building or unit of equipment is accessible from at least two sides for firefighting and fire control purposes.

4.1.2.3 Areas where unstable liquids are handled or small scale unit chemical processes are carried on shall be separated from the remainder of the plant by a fire wall of 2 hour minimum fireresistance rating.

4.1.2.4 Emergency drainage systems shall be provided to direct flammable or combustible liquid leakage and fire protection water to a safe location. This may require curbs, scuppers, or special drainage systems to control the spread of fire. Emergency drainage systems, shall not be connected to public sewers or discharged into public waterways.

4.1.2.5 Areas as defined in subdivision using Class 1 liquids shall be ventilated at a rate of not less than 0.3 cu. m/min./sq m of solid floor area. This shall be accomplished by natural or mechanical ventilation with discharge or exhaust to a safe location outside of the building. Provision shall be made for introduction of makeup air in such a manner as not to short circuit the ventilation. Ventilation shall be arranged to include all floor areas or pits where flammable vapours may collect.

Equipment used in a building and the ventilation of the building shall be designed so as to limit flammable vapour-air mixtures under normal operating conditions to the interior of equipment, and to not more than 1.5 m from equipment which exposes Class 1 liquids to the air. Examples of such equipment are dispensing stations, open centrifuges, plate and frame filters, open vacuum filters, and surfaces of open equipment.

4.1.2.6 The storage, transfer, and handling of liquid shall comply with the Gulf Standard mentioned in item 2.3.

4.1.3 Tank Vehicle and Tank Car Loading and Unloading

Tank vehicle and tank car loading or unloading facilities shall be separated from aboveground tanks, warehouses, other plant buildings or nearest line of adjoining property which may be built upon by a distance of 15 m for Class 1 and Class 2 liquids and 10 m for Class 3 liquids measured from the nearest position of any fill stem. Buildings for pumps or shelters for personnel shall be a part of the facility. Operations of the facility shall comply with the appropriate portions of item 4.2.3.

4.1.4 Fire Control

Portable fire extinguishers and control equipment shall be provided in such quantities and types as needed to comply with the Gulf Standard mentioned in item 2.4.

4.1.5 Sources of Ignition

4.1.5.1 Precautions shall be taken to prevent the ignition of flammable vapors. Sources lighters; of ignition include but are not limited to open flames, lighting, smoking, lighters, cutting and welding, hot surfaces, frictional heat, static, electrical, and mechanical sparks; spontaneous ignition, sparks producing machines, including heat-producing chemical reactions; and radiant heat.

4.1.5.2 Class 1 liquids shall not be dispensed into containers unless the nozzle and container are electrically interconnected. Where the metallic floorplate on which the container stands while filling is electrically connected to the fill stem or where the fill stem is bonded to the container during filling operations by means of a bond wire, the provisions of this item shall be deemed to have been complied with.

4.1.6 Electrical

4.1.6.1 All electrical wiring and equipment shall be installed according to the requirements of the Gulf Standard mentioned in item 2.5.

4.1.6.2 Locations where flammable vapour-air mixtures may exist under normal operations shall be classified Class 1, Division 1 according to the requirements of the Gulf Standard mentioned in item 2.5. For those pieces of equipment installed in accordance with item 4.1.2.5 the Division 1 area shall extend 1.5 m in all directions from all points of vapour liberation. All areas within pits shall be classified Division 1 if any part of the pit is within a Division 1 or 2 classified area, unless the pit is provided with mechanical ventilation.

4.2 Bulk Plants

4.2.1 Storage

4.2.1.1 Class 1 liquids shall be stored in closed containers, or in storage tanks above ground outside of buildings, or underground in accordance with the Gulf Standard mentioned in item 2.1.

4.2.1.2 Class 2 and Class 3 liquids shall be stored in containers, or in tanks within buildings or above ground outside of buildings, or underground in accordance with the Gulf Standard mentioned in item 2. 1.

4.2.1.3 Containers of flammable or combustible liquids when piled one upon the other shall be separated by dunnage sufficient to provide stability and to prevent excessive stress on container walls. The height of the pile shall be consistent with the stability and strength of containers.

4.2.2 Buildings

4.2.2.1 Rooms in which Class 1 liquids are stored or handled shall be heated only by means not constituting a source of ignition, such as steam or hot water. Rooms

containing heating appliances involving sources of ignition shall be located and arranged to prevent entry of flammable vapours.

4.2.2.2 Ventilation shall be provided for all rooms, buildings, or enclosures in which Class 1 and Class 2 liquids are pumped or dispensed. Design of ventilation systems shall take into account the relatively high specific gravity of the vapours. Ventilation may be provided by adequate openings in outside walls at floor level unobstructed except by louvers or coarse screens. Where natural ventilation is inadequate, mechanical ventilation shall be provided.

- Class 1 and Class 2 liquids shall not be stored or handled within a building having a basement or pit into which flammable vapours may travel, unless such area is provided with ventilation designed to prevent the accumulation of flammable vapours therein.
- Containers of Class 1 and Class 2 liquids shall not be drawn from or filled within buildings unless provision is made to prevent the accumulation of flammable vapours in hazardous concentrations. Where mechanical ventilation is required, it shall be kept in operation while flammable liquids are being handled.

4.2.3 Loading and Unloading Facilities

4.2.3.1 Tank vehicle and tank car loading or unloading facilities shall be separated from above ground tanks, warehouses, other plant buildings or nearest line of adjoining property by a distance of 15 m for Class 1 and Class 2 liquids and 10 m for Class 3 liquids measured from the nearest position of any fill spout. Buildings for pumps or shelters for personnel shall be part of the facility.

4.2.3.2 Equipment such as piping, pumps, and meters used for the transfer of Class 1 and Class 2 liquids between storage tanks and the fill stem of the loading rack shall not be used for the transfer of Class 3 liquids.

4.2.3.3 Valves used for the final control for filling tank vehicles shall be of the self closing type and manually held open except where automatic means are provided for shutting off the flow when the vehicle is full or after filling of a present amount.

4.2.3.4 Bonding facilities for protection against static sparks during the loading of tank vehicles through open domes shall be provided:

4.2.3.4.1 Where Class 1, Class 2 or Class 3 liquids are loaded into vehicles which may contain vapours from previous cargoes of Class 1 or Class 2 liquids, protection as required above shall consist of a metallic bond wire permanently electrically connected to the fill stem. The free end of such wire shall be provided with a clamp or equivalent device for convenient attachment to some metallic part in electrical contact with the cargo tank of the tank vehicle. Such bonding connection shall be made rast to the vehicle or tank before dome covers are raised and shall remain in place untill filling is completed and all dome covers have been closed and secured.

4.2.3.4.2 Bonding as specified above is not required in the following cases:

- Where vehicles are loaded exclusively with products not having a static accumulating tendency, such as asphalt, most crude oils, residual oils, and water soluble liquids.
- Where no Class 1 liquids are handled at the loading facility and the tank vehicles loaded are used exclusively for Class 2 and Class 3 liquids.
- Where vehicles are loaded or unloaded through closed bottom or top connections.

4.2.3.4.3 Filling through open domes into the tanks of tank vehicles or tank cars, that contain vapour-air mixtures within the flammable range or where the liquid being filled can form such a mixture, shall be by means of a downspout which extends near the bottom of the tank. This precaution is not required when loading liquids which are non-accumulators of static charges.

4.2.3.5 Tank car loading facilities where Class 1 and Class 2 liquids are loaded through open domes shall be protected against stray currents by bonding the pipe to at least one rail and to the rack structure if of metal. Multiple entering the rack area shall be electrically bonded together. In addition, in areas wee -c excessive stray currents are known to exist, all pipe entering the rack area shall be provided with insulating sections to electrically isolate the rack piping from the pipelines. No bonding between the tank car and the rack or piping is required during either loading or unloading of Class 3 liquids.

4.2.3.6 Class 1 and Class 2 liquids shall not be dispensed into containers unless the nozzle and container are electrically interconnected. Where the metallic floorplate on which the container stands while filling is electrically connected to the fill stem or where the fill stem is bonded to the container during filling operations by means of a bond wire, the provisions of this item shall be deemed to have been complied with.

4.2.3.7 The nozzle of air, inert gas and steam lines or hoses when used in the cleaning or ventilation of tanks and vessels that contain hazardous concentrations of flammable gases or vapours, shall be bonded to the tank or vessel shell. Bonding devices shall not be attached nor detached in hazardous concentrations of flammable gases or vapours.

4.2.3.8 Conductors used for bonding and grounding stationary equipment or conductors where installed in a fixed position shall be not smaller than 3.2 mm copper wire.

4.2.3.9 Bonding and grounding devices ' which are temporarily clamped or clipped to movable equipment shall have a conductor of ample length to assure the effective attachment of device. This conductor shall be stranded wire not smaller than 3.2 mm.

4.2.3.10 When attaching bonding and grounding clamps or clips, a secure and positive metal-to-metal contact shall be made. Such attachments shall be made before closures are opened and liquid movements are started and shall not be broken until after liquid movements are stopped and closures are made.

4.2.3.11 Static bonding and grounding installations shall be made in a workman like manner and shall be so designed constructed, installed and maintained that the hazard of sources of ignition caused by the discharge of static charges will be reduced as far as is reasonably possible.

4.2.3.12 Loading Platforms

4.2.3.12.1 Safe access shall be provided to the top of tank cars if employees must go on or the top of tank cars during loading or unloading operations.

4.2.3.12.2 Safe access shall be provided to the side catwalks or top of tank trucks and trailers if employees must go to such locations during loading or unloading operations.

4.2.3.12.3 Such access required by item 4.2.3.12.1-2 shall be from a fixed platform at least lm wide.

4.2.3.12.4 Where it has been necessary to install openings or equipment in the platform an unobstructed passageway at least 40 cm wide and 2 m high shall be maintained along the length of the platforms.

4.2.3.12.5 There shall be at least one stairway or ramp from the platform to the ground. If the loading platform is more than 7.6 m long and is not part of a warehouse platform, which can serve as a means of escape, there shall be at least one stairway or ramp no further than 3 m from each end of the platform.

4.2.3.12.6 Access from the fixed platform to the loading position shall be any one of the following methods:

By a gangplank hinged or otherwise suitably fastened to the platform. When not in use, gangplanks shall be latched or otherwise securely held in raised position, except where they may be safely left in a lowered position. Gangplanks shall provide at least 2 m vertical clearance and shall be at least 60 cm wide, and shall be provided with standard railings or other safeguards that will adequately protect employees from falling. Toeboards are not required on gangplanks.

By stepping directly from the fixed platform to the side catwalk or to top of the tank truck or trailer, if the vertical distance stepped is no more than 40 cm, and if the combined vertical and horizontal distance stepped is no more than 50 cm.

4.2.3.12.7 Loading from a can rack or bucket rack at the side of a truck or trailer is prohibited, unless safe footing equivalent to a catwalk is provided.

4.2.3.12.8 Where the vertical clearance above the side catwalk is less than 1.5 m an unobstructed passageway shall be provided beside each fill pipe, from the platform to the side catwalk. Such passageways shall be at least 40 cm wide and 2 m high.

4.2.3.12.9 Where the vertical clearance above the side catwalk is 1.5 m or more, at least one unobstructed passageway shall be provided from the platform to the side catwalk use for loading trucks or trailers. This passageway shall be at least 40 cm wide and 2 m high.

4.2.3.12.10 When it is necessary for employees to go on the top of tank trucks or trailers during loading operations, a vertical clearance of at least 2 m shall be provided between the top of the tank truck or trailers and fixed members or fixed parts of

the loading rack; provided, however, that this does not apply to movable loading spouts or arms.

4.2.3.12.11 The following need not comply with item 4.2.3.12.3, where:

– Locations where trucks and trailers are loaded through bottom connections.

– Locations where trucks or trailers are loaded during emergencies only, if the emergencies are too infrequent to warrant t loading platform.

4.2.4 Wharves

4.2.4.1 Wharf shall mean any wharf, pier, bulkhead, or other structure over or contiguous to navigable water used in conjunction with a bulk plant, the primary function of which is the transfer of flammable or combustible liquid cargo in bulk between the bulk plant and any tank vessel, ship, barge, lighter boat, or other mobile floating craft; and this item shall apply to all such installations.

4.2.4.2 Loading pumps capable of building up pressures in excess of the safe working pressure of cargo hose or loading arms shall be provided with bypasses, relief valves, or other arrangement to protect the loading facilities against excessive pressure. Relief devices shall be tested at not less than yearly intervals to determine that they function satisfactorily at the pressure at which they are set.

4.2.4.3 All pressure hoses and couplings shall be inspected at weekly intervals. The hose and couplings shall be tested with the hose extended and using the "lnservice maximum operating pressures". Any hose showing material deteriorations, signs of leakage, or weakness in its carcass or at the couplings shall be withdrawn from service and repaired or discarded.

4.2.4.4 Piping, valves and fittings shall be in accordance with the Gulf Standard mentioned in item 2.1, with the following exceptions and additions:

4.2.4.4.1 Flexibility of piping shall be assured by appropriate layout and arrangement of piping supports so that motion of the wharf structure resulting from wave action, currents, tides, or the mooring of vessels will not subject the pipe to repeated strain beyond the elastic limit.

4.2.4.4.2 Pipe joints depending upon the friction characteristics of combustible materials or grooving of pipe ends for mechanical continuity of piping shall not be used.

4.2.4.4.3 Swivel joints may be used in piping to which hoses are connected, and for articulated swivel-joint transfer systems, provided that the design is such that the mechanical strength of the joint will not be impaired if the packing material should fail, as by exposure to fire. Piping systems shall contain sufficient valves to operate the system properly and to control the flow of liquid in normal operation and in the event of physical damage. In addition to the above requirements, each line conveying flammable liquids leading to a wharf shall be provided with a readily accessible block valve located on shore near the approach to the wharf and outside of any diked area. Where more than one line is involved, the valves shall be grouped in one locations. Means of easy access shall be provided for cargo line valves located below the wharf deck.

4.2.4.4.4 Pipe lines on flammable or combustible liquids wharves shall be adequately bonded and grounded. If excessive stray currents are encountered, insulating joints

shall be installed. Bonding and grounding connections on all pipelines shall be located on wharfside of hose-riser insulating flanges, if used, and shall be accessible for inspection.

4.2.4.4.5 Pipe lines that are continuous from shore to wharf or pier and used to transport flammable liquids, vapours or gases shall be equipped with valves on shore so located as to be readily accessible and not endangered by a fire on the wharf or pier.

4.2.4.4.6 Each pier or wharf shall be provided with at least two ring type life buoys. If the pier is over 60 m in length, at least one such life buoy shall be provided for each additional 60 m over water. Life buoys shall be kept readily available for use.

4.2.4.4.7 Each life buoy shall have at least 15 m of 13 mm diameter line attached to it. The line shall be of manila fiber or equivalent, and shall be securely fastened to the buoy and not to the grabline of the buoy.

4.2.4.4.8 Employees working on or below the decking of a wharf or pier shall be protected against falling into the water by one of the following methods:

Use of adequate platforms equipped with railings.

Use of safety belts and life lines.

Other means affording equivalent protection.

In lieu of the above, an employee may wear a life jacket or other device capable of keeping him afloat should he fall into the water.

4.2.4.4.9 Water lights used at wharves or piers shall not be of a type which will create a source of ignition.

4.2.4.4.10 Hose or articulated swivel-joint connections used for cargo transfer shall be capable of accommodating the combines effects of change in draft and maximum tidal range, and mooring lines shall be kept adjusted to prevent the surge of the vessel from placing stress on the cargo transfer system.

4.2.4.4.11 Hose shall be supported so as to avoid kinking and damage from chafing.

4.2.4.5 Suitable portable fire extinguishers with a B-C rating shall be located within 26 m of those portions of the facility where fires are likely to occur, such as hose connections, pumps, and separator tanks.

4.2.4.5.1 Where piped water is available, ready-connected fire hose in size appropriate for the water supply shall be provided so that manifolds where connections are made and broken can be reached by at least one hose stream.

4.2.4.5.2 Material shall not be placed on wharves in such a manner as to obstruct access to firefighting equipment, or important pipeline control valves.

4.2.4.5.3 Where the wharf is accessible to vehicle traffic, an unobstructed roadway to the shore end of the wharf shall be maintained for access of firefighting apparatus.

4.2.4.6 Loading or discharging shall not commence until the wharf superintendent and officer in charge of the tank vessel agree that the tank vessel is properly moored and all connections are properly made. Mechanical work shall not be performed

on the wharf during cargo transfer, except under special authorization based on a review of the area involved, methods to be employed, and precautions necessary.

4.2.5 Electrical Equipment

4.2.5.1 This item shall apply to areas where Class 1 and 2 liquids are stored, or handled. For areas where Class 3 liquids only are stored or handled, the electrical equipment may be installed in accordance with the Gulf Standard mentioned in item 2.5, for ordinary locations.

4.2.5.2 All electrical equipment and wiring shall be of a type specified by and shall be installed in accordance with the Gulf Standard mentioned in item 2.5.

4.2.5.3 So far as it applies Table 1 shall be used to delineate and classify hazardous areas for the purpose of installation of electrical equipment under normal circumstances. In the Table a classified area shall not extend beyond an unpierced wall, roof, or other solid partition.

4.2.6 Class 1 or 2 liquids shall not be handled, drawn, or dispensed where flammable vapours may reach a source of ignition. Smoking shall be prohibited except in designated localities. “No Smoking” signs shall be conspicuously posted where hazard from flammable liquids vapours is normally present.

4.2.7 Provision shall be made to prevent flammable or combustible liquids which may be spilled at loading or unloading points from entering public sewers and drainage systems, or natural waterways. Connection to such sewers, drains, or waterways by which flammable or combustible liquids might enter shall be provided with separator boxes or other means whereby such entry is precluded. Crankcase drainings and flammable or combustible liquids shall not be dumped into sewers, but shall be stored in tanks or tight drums outside of any building until removed from the premises.

4.2.8 Suitable fire-control devices, such as small hose or portable fire extinguishers, shall be available to locations where fires are likely to occur. Additional fire control equipment shall be required where a tank of more than 190 cu m individual capacity contains Class 1 or 2 liquids and where an unusual exposure hazard exists from surrounding property. Such additional fire-control equipment shall be sufficient to extinguish a fire in the largest tank.

Table

Electrical Equipment Hazardous Areas - Bulk Plants

Location	Class 1 Class D Division	Extent of Classified Area
Tank vehicle and tank car(l). Loading through open dome	1	Within 1 m of edge of dome, extending in all directions.
	2	Area between 1 m and 1.5 m from edge of dome, extending in all directions.
Loading through bottom connect-ions with atmospheric venting	1	Within 1 m of point of venting to atmosphere extending in all directions.
	2	Area between 1 m and 1.5 m from point of venting to atmosphere, extending in all directions. Also up to 46 cm above grade within a horizontal radius of 3 m from point of loading connection.
Loading through closed dome with vapor recovery	2	Within 1 m of point of connection of both fill and vapour lines, extending in all directions.
Bottom loading with vapour recovery or any bottom unloading	2	Within 1 m of point of connections extending in all directions. Also up to 46 cm above grade within a horizontal radius of 3 m from point of connection.
Drum and container filling: Outdoors, or indoors with adequate ventilation.	1	Within 1 m of vent and fill opening, extending in all directions.

(1) When classifying the extent of the area, consideration shall be given to the fact that tank cars or tank vehicles may be spotted at varying points. Therefore, the extremities of the loading or unloading positions shall be used.

(Continued)

Location	Class 1 Class D Division	Extent of Classified Area
	2	Area between 1 m and 1.5 m from vent or fill opening, extending in all directions. Also up to 46 cm above floor or grade level within a horizontal radius of 3 m from vent or fill opening.
Outdoors, or indoors with adequate ventilation.	1	Within 1 m of vent and fill opening, extending in all directions.
Tank - Aboveground: Shell, ends, or roof and dike area.	2	Within 3 m from shell, ends, roof of tank, area inside dikes to level of top of dike.
Vent	1	Within 1.5 m of open end of vent, extending in all directions.
	2	Area between 1.5 m and 3 m from open end of vent, extending in all directions.
Floating roof	1	Area above the roof and within the shell.
Pits:		
Without mechanical ventilation	1	Entire area within pit if any part is within a Division 1 or 2 classified area.
With mechanical ventilation	2	Entire area within pit if part is within a Division 1 or 2 classified area.
Containing valves, fittings or piping, and not within a Division 1 or 2 classified area.	2	Entire pit.
Pumps, bleeders, withdrawal fittings, meters and similar devices: Indoors	2	Within 1.5 m of any edge of such devices, extending in all directions. Also up to 1 m above floor or grade level within 7.6 m horizontally from any edge of such devices.
Outdoors	2	Within 1 m of any edge of such devices, extending in all directions. Also up to 46 cm above grade level within 3 m horizontally from any edge of such devices

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(Continued)

Location	Class 1 Class D Division	Extent of Classified Area
Storage and repair garage for tank vehicles	1	All pits or spaces below floor level.
	2	Area up 46 m above floor or grade level for entire storage or repair garage.
Drainage ditches, separators impounding basins.	2	Area up to 46 cm above ditch separator or basin. Also up to 46 cm above grade within 4.6 m horizontally from any edge.
Garages for other than tank Vehicles Outdoors drum storage	Ordinary Ordinary	If there is any opening to these rooms within the extent of an outdoor classified area, the entire room shall be classified area, the entire room shall be classified the same as the area classification at the point of the opening.
Indoor warehousing where there is no flammable liquid transfer Office and rest rooms	Ordinary Ordinary	If there is any opening to these rooms within the extent of an indoor classified area, the room shall be classified the same as if the wall, curb or partition did not exist.